

TWO NEW TAXA OF *SCUTELLARIA* SECTION *RESINOSA* (LAMIACEAE)
FROM NORTHERN ARIZONA

S.L. Rhodes and T.J. Ayers

Department of Biological Sciences
P.O. Box 5640, Northern Arizona University
Flagstaff, Arizona 86011-5640, U.S.A
slr314@gmail.com; tina.ayers@nau.edu

ABSTRACT

Collections made in Yavapai and Coconino counties, Arizona, previously identified as *Scutellaria potosina*, are here described as new varieties, one in *S. potosina* and the other in *S. platyphylla*. Variety **occidentalis** increases the range of the *S. platyphylla*, a species endemic to central Arizona, northwest to the Upper Verde Watershed. Variety **kaibabensis** brings the total number of varieties of *S. potosina* to nine and represents the northern and western-most populations of that widespread, Chihuahuan desert species.

RESUMEN

Colectas llevadas a cabo en los condados de Yavapai y Coconino, Arizona, previamente identificadas como *Scutellaria potosina*, se describen como variedades nuevas, una en *S. potosina* y la otra en *S. platyphylla*. La variedad **occidentalis** incrementa el rango de *S. platyphylla*, especie endémica de la parte central de Arizona, en dirección noroeste, hacia la cuenca alta del Río Verde. La variedad **kaibabensis** incrementa el número total de variedades de *S. potosina* a nueve, y representa las poblaciones más norteñas y occidentales de esta especie de amplia distribución en el desierto de Chihuahuense.

KEY WORDS: *Scutellaria potosina*, *Scutellaria platyphylla*, Lamiaceae sect. *Resinosa*, SEM, vestiture, mericarps

Scutellaria sect. *Resinosa* Epling is well represented in the southwestern U.S. and throughout northern and central mainland Mexico. Epling (1942) defined sect. *Resinosa* based on the presence of entire, oval or rounded leaves, violet-blue corollas, corolla tube and galea less than 22 mm long, calyx compressed into an erect and transverse scutellum, and subglobose mericarps. Turner's (1994) revision of sect. *Resinosa* provided evidence for a broadly distributed *S. potosina* Brandegee, which occurs from the Sierra Madre Oriental, Mexico north and west to central Arizona. The species was comprised of two subspecies: subsp. *potosina*, a morphologically diverse group of six varieties; and subsp. *platyphylla* Epling, represented by the type variety only. *Scutellaria potosina* was separated from the other 18 species in sect. *Resinosa* by the presence of tessellate mericarps and a pubescence of glandular and eglandular hairs. Turner described four new varieties of *S. potosina* in his treatment of *Scutellaria* sect. *Resinosa* based on differences in habit, leaf morphology, and vestiture. *Scutellaria potosina* var. *platyphylla* was later elevated to specific status by Turner and Delprete (1996) based on mericarp ornamentation, foliage vestiture, and distribution.

Collections made in Yavapai and Coconino counties, Arizona, previously identified as *S. potosina*, appeared to be intermediate between *S. potosina* and *S. platyphylla* (Epling) B.L. Turner & P. Delprete. These collections represent two different entities from four localities on the eastern rim of the Kaibab Plateau in Coconino County and three localities in the Upper Verde River drainage in Yavapai County. Both entities have a distinctive short stature and prolific branching from the root crown not seen in either *S. potosina* or *S. platyphylla*. However, they appeared to differ significantly in vestiture when viewed under a dissecting microscope.

All of the 12 recent collections have been made since 1993 except for one specimen from the Upper Verde watershed collected in 1984 (Hodgson 2887, DES). This specimen was not included by Turner in his 1994 taxonomic treatment nor his subsequent morphological studies (Turner & Delprete 1996).

A SEM study was undertaken to visualize micromorphological characters needed to verify the taxonomic rank of the new collections and their placement within sect. *Resinosa*. Leaf vestiture and mericarp size, color, and shape of the two new taxa fit well within the sect. *Resinosa*, but a SEM study was needed to

visualize individual hair types and papillae on the mericarps, both important species level characteristics in *Scutellaria* (Olmstead 1990; Turner 1996).

The Kaibab Plateau populations are unique in that the leaves lack glandular and eglandular hairs altogether but are densely covered with sessile glands on both the upper and lower surfaces. Leaves of known varieties of *Scutellaria potosina* in the U.S. and northern Mexico also lack glandular hairs but var. *tessellata* (Epling) B.L. Turner has scattered eglandular hairs and a few sessile glands on the upper and lower leaf surfaces, while var. *grahamiana* B.L. Turner is nearly glabrous, with few sessile glands and eglandular hairs. The mericarp surface-sculpturing of the Kaibab Plateau populations is similar morphologically to var. *tessellata*. Both have short flattened papillae with epidermal cells that have conical or domed apices without apical callosities (Fig. 1). The holotype and one topotype of var. *grahamiana* lacked mericarps and none was found during field work conducted in 2000. Var. *grahamiana* may require outcrossing, lack its pollinator, or may possibly represent a sterile hybrid of unknown origin. Based upon field observations and morphological study, including SEM of leaves and mericarps (Table 1), the Kaibab Plateau population is here described as a new variety of *S. potosina*, differing chiefly in habit and a vestiture of sessile glands only.

The Upper Verde populations are densely covered with sessile glands and glandular hairs similar to *S. platyphylla*, although those found on *S. platyphylla* are long, ca. 50 microns, while those on the Upper Verde plants are only ca. 20 microns (Fig. 1, C and D). Mericarp surface sculpturing of the Upper Verde plants also resembles that found in *S. platyphylla* (Turner 1996). Both have short conical papillae that are domed at the apex and flask-shaped epidermal cells. The Upper Verde populations have very pronounced apical callosities, some of which are extended into a narrow elongated or curved tip, like those of *S. platyphylla* (Fig. 1, I and J). Based upon field observations and the morphological study, including SEM of leaves and mericarps (Table 1), the Upper Verde populations are here described as a new variety of *S. platyphylla*, differing chiefly in habit and a vestiture of dense short eglandular hairs. The recognition of this new taxon within *S. platyphylla*, following Turner and Delprete (1996), is preferred until the species boundaries in sect. *Resinosa* have been more thoroughly investigated.

TAXONOMIC TREATMENT

Scutellaria potosina* var. *kaibabensis S. Rhodes & T. Ayers, var. nov. (Fig. 2, A–E; Fig. 3, A–C). TYPE: U.S.A.

ARIZONA: Coconino Co.: East rim of the Kaibab Plateau, North Canyon Trail #4, 36°25'04"N 112°04'17"W (NAD 27), 2133 m (7000 ft), 9 Jul 1998, Suzanne Rhodes 9811 with Tina Ayers (HOLOTYPE: ASC; ISOTYPES: ARIZ, ASU).

Simile *Scutellaria potosina* var. *tessellata* cum caules simplici; foliis subsessilis; et vestis glandula sessilis sola vel raro cum pili brevi eglanduliferi.

Perennial rhizomatous herbs, 12–16 cm high. Stems simple, erect or ascending from a woody caudex, yellow-green, with scattered sessile glands, hirtellous to glabrous, hairs eglandular, retrorse; older stems persistent. Leaves sessile to subsessile, elliptic to obovate, 9–15 mm long, 5–7 mm wide, ca. 2× as long as wide, margins entire, apex rounded, adaxial surface glabrous except for dense sessile glands, abaxial surface with a few scattered short (<10µm) hairs in addition to sessile glands. Flowers axillary in upper stem leaves; calyx densely glandular; corolla 9–13 mm long, tube diameter at throat 3.9–6.0 mm, outer surface with sessile glands and short gland-tipped hairs, limb deep violet-blue, throat white with purple spots. Mericarps 1.0–1.5 mm long, black, with an obscure apical callosity on some papillae.

Plants of dry sandy soil, often near ephemeral drainages; east side of Kaibab Plateau and western House Rock Valley (Fig. 4); ponderosa pine-white fir, piñon-juniper, and interior chaparral associations (1250–)1950–2606 m [(4100–)6300–8550 ft]. Flowering May–August.

Scutellaria potosina var. *kaibabensis* is endemic to the eastern edge of the Kaibab Plateau in northern Arizona. The closest known populations of *S. potosina* are of var. *grahamiana* in southwestern Graham County, which occurs below 4,000 ft in elevation and var. *tessellata* in Pima, Cochise and Santa Cruz counties of southern Arizona, which is found between 3,500 and 5,500 ft. Var. *kaibabensis* occurs further northwest than any other known populations in sect. *Resinosa*, and 250 miles north of the nearest populations of *S. potosina*. This variety is the sole representative

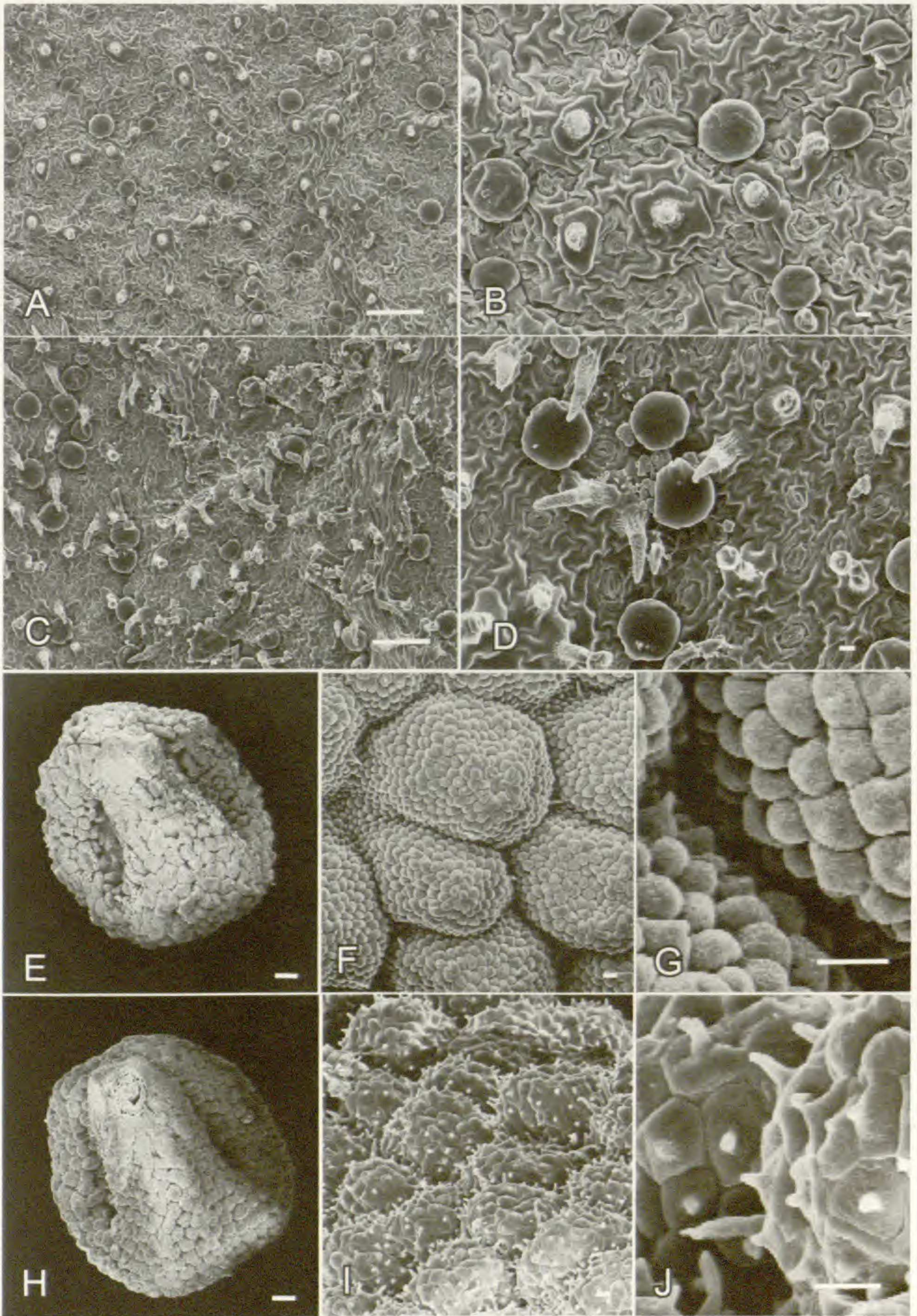


FIG. 1. Scanning electron micrographs of leaves and mericarps. A–B: *Scutellaria potosina* var. *kaibabensis* upper leaf surface; C–D: *S. platyphylla* var. *occidentalis* upper leaf surface; E–G: *S. potosina* var. *kaibaensis* mericarp; E. ventral view of mericarp, F. papillae, G detail of surface cells. H–J: *S. platyphylla* var. *occidentalis* mericarp; H. ventral view of mericarp, I. papillae, J. detail of surface cells. Scale bars: A, C, E, H 100 μ m; B, D, F, G, I, J 10 μ m.

TABLE 1. Morphological characteristics that distinguish the varieties of *Scutellaria potosina* and *S. platyphylla* in Arizona.

Character\Taxon	<i>S. potosina</i> var. <i>kaibabensis</i>	<i>S. potosina</i> var. <i>grahamiana</i>	<i>S. potosina</i> var. <i>tessellata</i>	<i>S. platyphylla</i> var. <i>occidentalis</i>	<i>S. platyphylla</i> var. <i>platyphylla</i>
Stem:					
architecture	simple	branched	branched	usu. simple	branched
height	12-20(-30) cm	33-38 cm	20-32 cm	12-17 cm	25-45 cm
sessile glands	dense, crowded	few, scattered	few, scattered	dense, crowded	dense, crowded
hairs, gland-tipped	absent	absent	absent	present	present
hairs, eglandular	sparse	sparse	sparse	dense	dense
Leaves:					
shape	elliptic-ovate	ovate	ovate	elliptic-ovate	lance-ovate
margin	entire	entire	shallowly crenate-dentate	entire	rarely minutely crenate
hairs, adaxial	absent	absent	few, scattered, 20-30 μ m	dense, crowded, 20-30 μ m	dense, crowded, >50 μ m
hairs, abaxial	few, scattered,	few, on veins only,	few, scattered, 20-30 μ m	dense, crowded, 20-30 μ m	dense, crowded, >50 μ m
<10 μ m	20-30 μ m				
Flower:					
pedicel length	2 mm	2.5-3 mm	2-3 mm	2.5-3 mm	1-2 mm
corolla tube length	9-13	7-10	7-10	7-11	6-8
corolla tube basal diam.	1.2-2.0	(1.1-1.5-2.4	1.1-2.3	1.5-3.2	1.0-1.3
corolla tube diam at throat	3.9-6.0	3.0-5.8	3.7-4.3	4.3-5.6(-6.3)	2.8-5.6
Mericarps:					
size	1-1.5 mm	*	1.2-1.8 mm	ca. 1.5	1.5-2 mm
papillae shape at apex	flattened	flattened	flattened	domed	domed
epidermal cell elongation	absent	absent	absent	present	present
Flowering time:	May-August (4100-)	May-June	May-Oct	May	Apr-Oct(-Jan)
Elevation:	6400-8400 ft	3950 ft	3500-5500 ft	5400-6400 ft	1980-2300 ft
Vegetation Community:	ponderosa pine/ gambel oak riparian	piñon-juniper riparian	Mexican oak/pine woodland riparian	piñon-juniper riparian	chaparral riparian

* mericarps have not been observed on any specimens of *Scutellaria potosina* var. *grahamiana*.

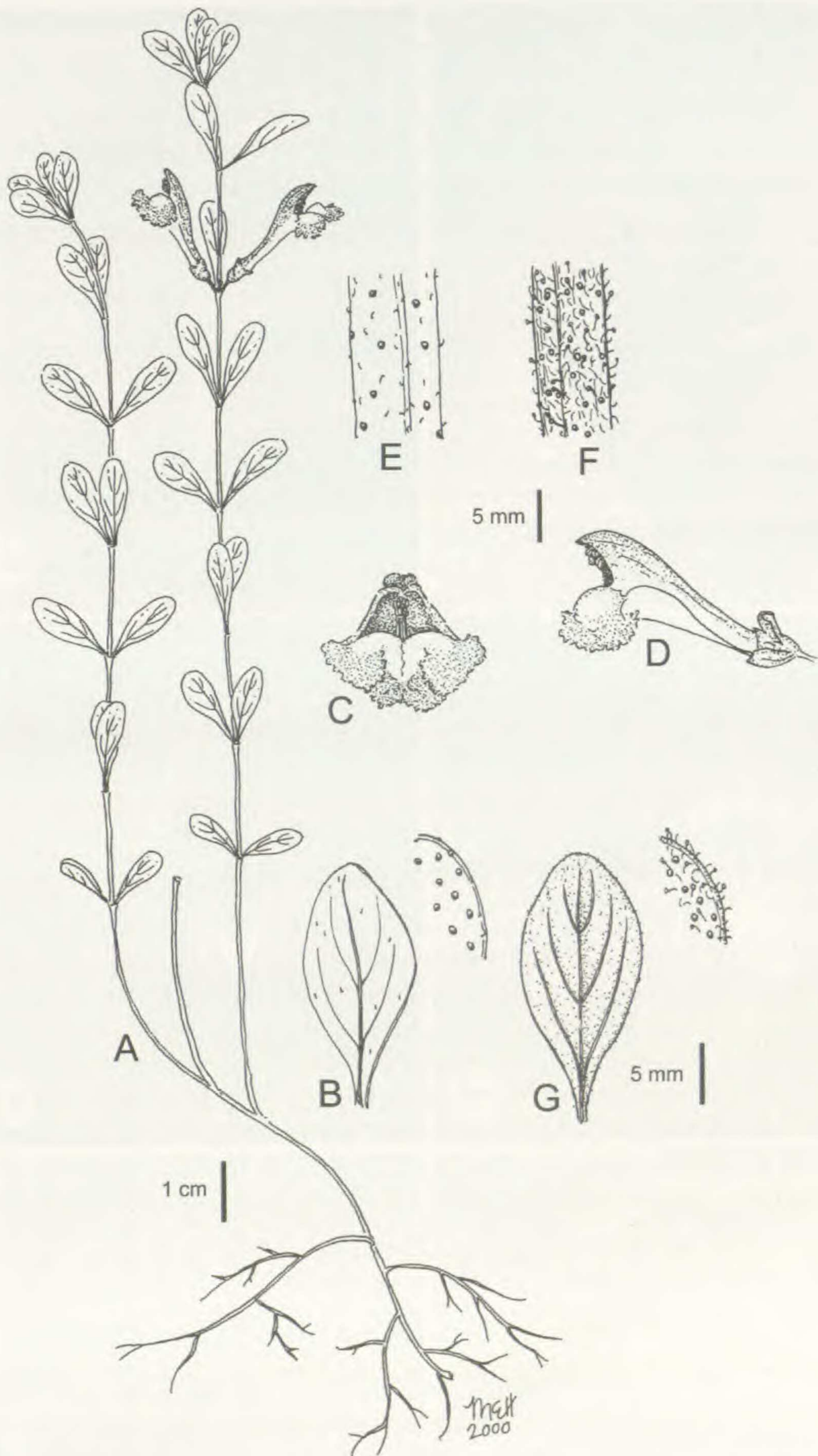


FIG. 2. A–E: *Scutellaria potosina* var. *kaibabensis*. A. Habit. B. Leaf blade with closeup showing vestiture. C. Corolla, front view. D. Flower, side view. E. Stem with glands and sparse eglandular hairs. F–G: *S. platyphylla* var. *occidentalis*. F. Stem with eglandular and gland-tipped hairs. G. Leaf blade with closeup showing vestiture.

found in the Colorado Plateau Floristic area, all other varieties are in the Apachean or Chihuahuan Floristic areas (McLaughlin 1986, 1989). The compact growth-form and larger corollas make this taxon particularly striking when in flower (Table 1). Variety *kaibabensis* is densely clothed with sessile glands but is otherwise glabrous or possesses just a few short hairs. The lack of eglandular hairs is similar to var. *grahamiana*, but the number and density of sessile glands, and architecture can easily separate the two.

PARATYPE: U.S.A. ARIZONA. Coconino Co.: Kaibab Plateau: East Rim View Point along Trail #7 ca. 2¼ mi down from trailhead, in North Canyon; 36°25'18"N, 112°04'22"W, 2133 m (7000 ft); 1 Jul 1993, W. Hodgson 7334 (DES, ASU).

Additional specimens: U.S.A. ARIZONA. Coconino Co.: Kaibab Plateau, Marble Canyon Overlook, ca. ½ mi N of the end of FR 219, on ridgetop; 36°24'35"N, 112°03'28"W (NAD 27) 2606 m (8550 ft), 21 Jun 1999, Rhodes 9954 (ASC); Marble Canyon, South Canyon trail, ca. 5 km upstream from the Colorado River 36°29'02"N, 111°54'07"W, 1244 m (4180 ft); 18 May 1996, Stevens s.n. (ASC); Kaibab National Forest, Cocks Comb, off FSR 445A, ca. 7 mi W of FSR 445, 36°23'37"N, 112°00'41"W (NAD 27) 1920 m (6300 ft); 20 Jun 1998, Hodgson 11076 (ASU), 11089 (ASU, DES); North arm of Nankoweap Canyon between Sieber and Marion Points, below top of the Tapeats Sandstone, 12S 415000E 4017380N (NAD 27) 5100 ft, 20 May 2008, Rink 7091 (ASC); South Canyon, ca. 0.2 mi downstream from where the trail drops to the bottom of the canyon, growing along rocky ephemeral drainage channel, 12S 417366E 4036917N (NAD 84) 4400 ft, 6 May 2007, Christie 1418 (ASC).

Scutellaria platyphylla var. **occidentalis** S. Rhodes & T. Ayers, var. nov. (Fig. 2, F–G; Fig. 3, D–F). TYPE:

U.S.A. ARIZONA: Yavapai Co.: Limestone Canyon, 7 mi W of Hwy. 89 on FR 573, 35°01'30"N, 112°29'00"W (NAD 27), 1658 m (5440 ft), 10 Jul 1999, S. Rhodes 9964 (HOLOTYPE: ASC; ISOTYPES: ARIZ, ASU).

Simile *Scutellaria platyphylla* sed cum caules simplici; foliis subsessilis; et vestis glandula sessilis et pili glanduliferi brevi.

Perennial rhizomatous herbs, 12–16 cm high. Stems simple, erect or ascending from a woody caudex, yellow-green with scattered sessile glands, densely hirtellous, hairs gland-tipped; older stems persistent. Leaves sessile to subsessile, elliptic to obovate, 11–19 mm long, 5–8 mm wide, ca. 2× as long as wide, margins entire, apex rounded, both leaf surfaces hirtellous with scattered sessile glands, short (20–30 microns) gland-tipped hairs, and a few sparsely scattered longer (>30 microns) hairs. Flowers axillary in upper stem leaves; pedicels 2.5–3.0 mm; calyx with dense sessile glands and gland-tipped hairs; corolla 7–11 mm long, tube diameter at throat 4.3–5.6 (6.3) mm, outer surface with minute, sparse hairs and scattered glands, limb dark violet, aging blue; throat white with purple spots. Mericarps 1.0–1.5 mm long, greenish-black with a prominent, often elongate apical callosity on the papillae. Plants of dry sandy soil; Upper Verde River drainage, northern Yavapai County (Fig. 4); Piñon-juniper associations. 1646–1950 m (5400–6400 ft). Flowering May.

Scutellaria platyphylla var. *occidentalis* is endemic to the Upper Verde River drainage of northern Yavapai County, where it is locally abundant. These populations occur as a northwestern range extension of the current distribution of *S. platyphylla*. Epling (1942) makes reference to a specimen collected near Ashfork (Toumey 385, ARIZ) in the exsiccatae for *S. tessellata*, but noted that it was anomalous with “pubescence like that of *S. resinosa*, but glandular” in his discussion of *S. potosina* subsp. *platyphylla*. This collection is the earliest specimen referable to this taxon. Variety *occidentalis* also has smaller corollas, a mixture of sessile glands, eglandular, and gland-tipped hairs, but the hairs are consistently a fraction of the length of the hairs found in var. *platyphylla*.

PARATYPE: U.S.A. ARIZONA. Yavapai Co.: 2.7 km SE of Rock Butte, Limestone Canyon, dry canyon bottom, N3871380, E370420, T18N, R2W, NW ¼ NE ¼ Sec. 1; 1450 m (4760 ft), 23 Jun 1994, M. Baker 11469 (ASU).

Additional specimens: U.S.A. ARIZONA. Yavapai Co.: Juniper Mesa, Dry, E facing slope south of Pine Spring; 326314, 3870895 (NAD 27) 1950 m (6400 ft); 9 Jun 2001, Rhodes 215 (ASC); Juniper Mesa Wilderness Area, ca. 200 m SE of Pine Springs. 34.9635°N, 112.90289°W, T18N, R6W, S9, 1954 m (6410 ft), 20 Jun 1992, Baker 9598 (ASU); Juniper Mts, 50 yards S of FSR 7 and Mud Spring Rd, T18N, R6W, S4, 6000 ft, 18 May 1984, Hodgson 2887 (DES); Ash Forks, 26 Jun 1892, J.W. Toumey 385 (ARIZ).

KEY TO THE SCUTELLARIA SECT. RESINOSA TAXA IN ARIZONA

1. Plants densely pubescent on stems and leaves; pubescence of gland-tipped hairs _____ **S. platyphylla**
2. Stems rarely branched above middle; gland-tipped hairs ca. 0.1 mm long; plants of northwestern Yavapai County _____ var. **occidentalis**
2. Stems many-branched above middle; gland-tipped hairs 0.4–0.6 mm long; plants of Apache, Gila, Maricopa, and Pinal counties _____ var. **platyphylla**
1. Plants with few hairs on leaf surfaces, pubescence of eglandular hairs _____ **S. potosina**

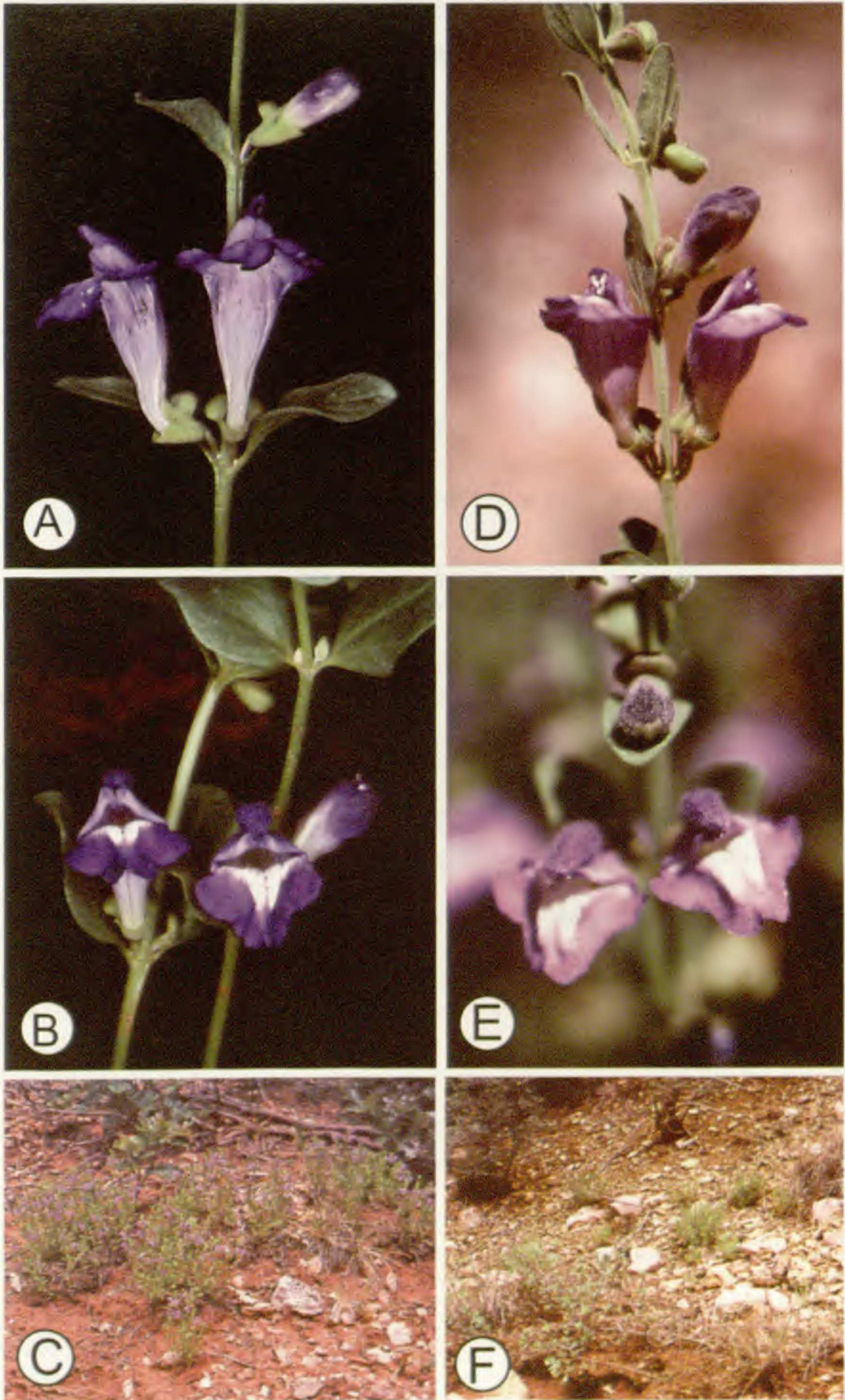


FIG. 3. A–C: *Scutellaria potosina* var. *kaibabensis*. A. Flowers. B. Corollas. C. Habit. D–F: *S. platyphylla* var. *occidentalis*. D. Flowers. E. Corollas. F. Habit.

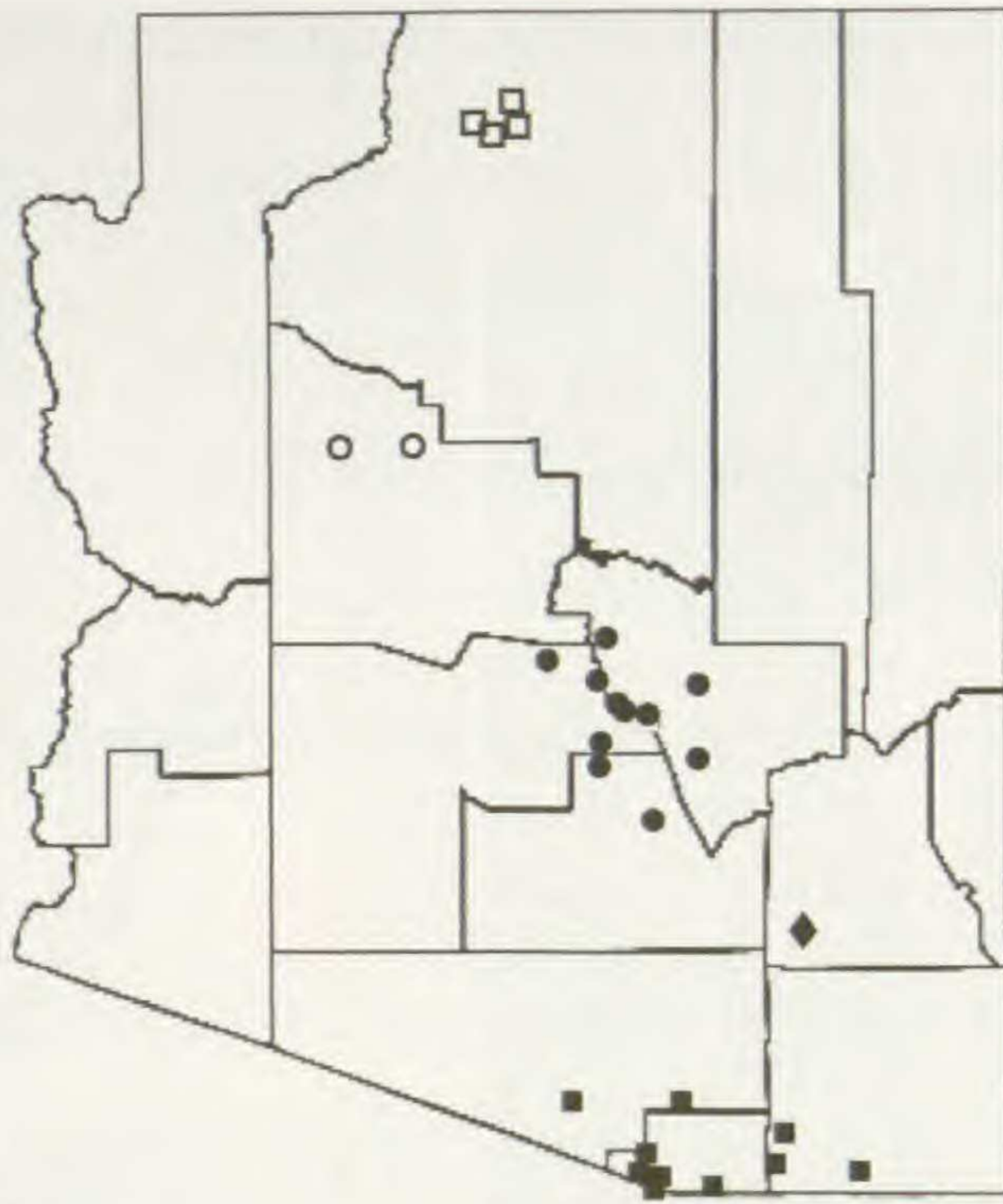


FIG. 4. Distribution of the *Scutellaria* sect. *Resinosa* in Arizona. *S. potosina* var. *tessellata* closed square (■), *S. potosina* var. *kaibabensis* open square (□), *S. potosina* var. *grahamiana* closed diamond (◆); *S. platyphylla* var. *platyphylla* closed circle (●), *S. platyphylla* var. *occidentalis* open circle (○).

3. Stems uniformly pubescent with a dense vestiture of short eglandular hairs; plants of Cochise, Santa Cruz, and Pima counties _____ var. **tessellata**
3. Stems glabrous or with a few scattered hairs.
4. Stems simple, 12–16 cm tall, with sessile glands only or rarely with short eglandular hairs; leaves densely covered with sessile glands; plants of northern Coconino County _____ var. **kaibabensis**
4. Stems branched above middle, 33–38 cm tall, with sessile glands and short eglandular hairs; leaves with a few scattered sessile glands; plants of southwestern Graham County _____ var. **grahamiana**

ACKNOWLEDGMENTS

Thanks to Mar Elise Hill for the botanical illustrations, Romey Haberle for providing location information for the Upper Verde River drainage populations, Sue Holiday for help with the Latin diagnoses, Citlali Cortés Montaña for the Spanish translation, and Larry Stevens, whose collection started us down this road in the first place. Thanks also to David Hammond and Randy Scott for editorial advice and to the following herbaria for loaning specimens: ARIZ, ASU, DES, TEX.

REFERENCES

- EPLING, C. 1942. The American species of *Scutellaria*. Univ. Calif. Publ. Bot. 20:1–146.
- MCLAUGHLIN, S.P. 1986. Floristic analysis of the southwestern United States. Great Basin Naturalist 46, No. 1: 46–65.
- MCLAUGHLIN, S.P. 1989. Natural floristic areas of the western United States. J. Biogeogr. 16, 239–248.
- OLMSTEAD, R.G. 1990. Systematics of the *Scutellaria Angustifolia* complex (Labiatae). Contr. Univ. Michigan Herb. 17:223–265.
- TURNER, B.L. 1994. A taxonomic overview of *Scutellaria*, section *Resinosa* (Lamiaceae). Phytologia 76:345–382.
- TURNER, B.L. AND P.G. DELPRETE. 1996. Nutlet sculpturing in *Scutellaria* sect. *Resinosa* (Lamiaceae) and its taxonomic utility. Pl. Syst. Evol. 199:109–120.